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The feasibility study on Non-pixel X-ray detector using liquid crystal layer through simulation of transmittance and electric field

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In recent times, the study of digital X-ray detector in medical diagnostic has been focused on high resolution image acquisition. The manufacturing methods of digital X-ray detectors can be divided into direct and indirect methods. The indirect system has a low resolution due to blurring of light from scintillator. In contrast, the direct method has higher resolution comparing with indirect method. But it is expensive and having difficult to manufacture in large size by using TFT(thin-film-transistor) array. The new fabricated method on medical imaging sensor has been studied variety to compensate these many problems. In this study, the new-concept is proposed for non-pixel X-ray detector by making multi-layer using photoconductor layer and liquid crystal cell used in the display field. The simulations of transmittance and electric field in liquid crystal layer were carried out according to the variation of the applied voltage and photoconductor layer structure. And then, non-pixel X-ray detector film was fabricated by considering the simulated results on liquid crystal cell structure and glass thickness. In the experiment, the linear range of LC twisting was acquired by measure of T-V (Transmittance-Voltage) Curve. The generated voltage from Photoconductor was acquired by changing the glass thickness and the voltage enable LC to twist over 90%. the feasibility of new structure detector was evaluated by using Back Light Unit and X-ray film. In the result of this study, non-pixel detector using liquid crystal cell showed enough feasibility to apply digital X-ray detector.

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